**Before the**
**FEDERAL COMMUNICATIONS COMMISSION**
**Washington, D.C. 20554**

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| **In the Matter of** | ) | |
| | ) | |
| **AMENDMENT OF PART 15 REGARDING** | ) | **ET Docket No. 04-37** |
| **NEW REQUIREMENTS AND** | ) | |
| **MEASUREMENT GUIDELINES FOR** | ) | |
| **ACCESS BROADBAND OVER POWER** | ) | |
| **LINE SYSTEMS** | ) | |

To: The Commission

<u>Background</u>

ShipCom, LLC owns and operates 4 Maritime Public Coast Stations licensed by the Commission as KLB KNN WCL and WLO. These Public Coast Stations provide Ship to Shore radio communications services to vessels on the High Seas and to aircraft. The ShipCom stations operate on numerous frequencies in the HF band from 2 MHz to 25 MHz. ShipCom provides HF voice, telex, E-mail and other data services on its licensed HF and VHF frequencies. ShipCom's flagship station, WLO, has been providing HF communications services to the maritime industry continuously for more than 55 years.

<u>Reply Comments</u>

Several of the BPL advocates have made statements claiming that the interference caused by BPL transmissions range from little interference to no interference. At least one company stated that they had received "no complaints of interference" during their BPL trials.

ShipCom questions whether parties that may have experienced interference during these trials were even aware that the interference might have been caused by BPL test transmissions. It is not reasonable to assume that a law enforcement officer or other first responder would realize or even have the technical knowledge to determine whether a failure of a communication system (hand held portable or mobile) was caused by BPL interference. It is more likely that users thought the communication failure was due to the vagaries of radio communication or the affected piece of equipment was returned to the radio repair shop for an "unknown problem". In other cases, first responders may not even be aware that they have lost communication and may only assume there was no radio traffic at the time.

The mere fact that advocates of BPL are proposing interference mitigation techniques is, in and of itself, an admission that interference will occur. In this NPRM matter the Commission has failed to clearly state how mitigation will occur, what steps must be taken to begin the mitigation process, the time it will take to resolve the issue and the remedies for failure to resolve the issue promptly.

ShipCom operates on more than 200 licensed frequencies from 2 MHz to 25 MHz. These frequencies are in use 24 hour a day 7 day a week. Many of these frequencies are used for data transmission where a difference in the noise floor of only a few DB can make the difference between being able to communicate and not being able to communicate. Typically these frequencies are not monitored by a person; they operate under computer control and are for the most part unattended. ShipCom is concerned that it may receive interference on its frequencies and not be immediately aware that the interference exist. This could result in frequencies being rendered unusable for extended periods of time resulting in loss of revenue to ShipCom and more importantly the possible lost of life and property due to a failure to receive an emergency communication.

ShipCom also uses trained operators to guard many HF SSB voice channels. Typically the HF receivers for these channels are operated in a squelched mode. A specified difference in the signal to noise ratio is required to un-squelch the receiver so a call is audible to the operator. In many cases an increase in the noise floor of only a few DB would prevent the squelch from enabling the speakers, resulting in a call being unanswered. The operator would not be aware that BPL interference had caused the failure and would not even know that a failure had occurred. Therefore the operator would not initiate any mitigation procedures.

ShipCom notes that at least one BPL proponent advocates an automatic mitigation procedure whereby a strong signal on a frequency would automatically cause the BPL system to change to a different set of frequencies. ShipCom believes this approach is fatally flawed. Often the received signal strength of ShipCom's subscribers is very low and would not likely trigger the proposed automatic interference mitigation system. Additionally, ShipCom's frequencies are duplex channels. That is, the mobile transmits on one frequency and ShipCom transmits on a different frequency. While the automatic interference mitigation system might cease use of ShipCom's transmit frequency, it probably would not respond to ShipCom's receive frequency.

The problem is further complicated by the fact that ShipCom has separate transmit and receive sites. ShipCom’s transmit and receive sites are separated by several miles at its Mobile Alabama facilities, WCL and WLO and at its Seattle facility, KLB. ShipCom uses Omni directional and high gain directional antennas to receive the often weak signals from its subscribers. It is extremely doubtful that the proposed automatic interference mitigation system would function near ShipCom's receiver locations.

Separate sites for transmission and reception are considered “best practice” for long distance HF communications. The US Coast Guard and other HF licensed operators also separate their transmitter and receive sites.

For an automatic interference mitigation system to work in proximity to ShipCom’s facilities, it would have to have receive capability equivalent to ShipCom’s and be able to coordinate with ShipCom’s send/receive frequency pairs. If the BPL system operator near the ShipCom receive site were different from the BPL operator near the ShipCom transmit site, the coordination problem would be even greater because sometime ShipCom responds to a received signal and other times it originates a call to a vessel or aircraft.

To further exacerbate the BPL interference problem, it is important to note that many of ShipCom’s transmit and receive antennae are mounted on towers, some of which are up to 200 feet high. From the NTIA we learned that the current guidelines for measuring BPL signal strength underestimates the interference by as much as much as 10.7 dB (see Summary chart following). We also learned from the NTIA study that interference increases with height.

It is important to note that ShipCom regularly services aircraft in the course of its business activities. Interference with aircraft extends up to “40 km of the center of the BPL deployment area”. Wide-spread deployment of BPL would severely impede HF communications throughout the United States.

Quotes from the NTIA study follow:

> Summary
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> “NTIA executed three two-week measurement campaigns and used Numerical Electromagnetic Code (NEC) software to characterize BPL signal radiation and propagation. These efforts revealed that BPL systems generate the highest electric field strength near the BPL device for horizontal-parallel polarized signals. However, these systems generate peak vertically-polarized field strength under and adjacent to the power lines and at impedance discontinuities at substantial distances from the BPL device. BPL systems generate peak field strength having horizontal-perpendicular polarization at small distances (e.g., less than 30 meters) from both the BPL device and power lines. Thus, measurements intending to demonstrate compliance with the Part 15 field strength limits

should not focus solely on the BPL device. Using NEC, NTIA evaluated interference risks in terms of the geographic extent of locations where interference may occur to radio reception at four frequencies used by outdoor, overhead BPL systems conforming to existing Part 15 rules. Interference to land vehicle, boat, and fixed stations receiving moderate-to-strong radio signals is likely in areas extending to 30 meters, 55 meters, and 230 meters, respectively, from one BPL device and the power lines to which it is connected. With low-to-moderate desired signal levels, interference is likely at these receivers within areas extending to 75 meters, 100 meters and 460 meters from the power lines. Assuming that co-frequency BPL devices are deployed at a density of one per km 2 within a circular area of 10 km radius, interference to aircraft reception of moderate-to-strong radio signals is likely to occur below 6 km altitude within 12 km of the center of the BPL deployment. Interference likely would occur to aircraft reception of weak-to-moderate radio signals within 40 km of the center of the BPL deployment area. However, at two of the four BPL frequencies considered with the assumed power lines, NTIA predicted smaller areas over which interference is likely.

Critical review of the assumptions underlying these analyses revealed that application of existing Part 15 compliance measurement procedures for BPL systems results in a significant underestimation of peak field strength. Underestimation of the actual peak field strength is the leading contributor to high interference risks. As applied in current practice to BPL systems, Part 15 measurement guidelines do not address unique physical and electromagnetic characteristics of BPL radiated emissions. Refining compliance measurement procedures for BPL systems will not impede implementation of BPL technology because BPL networks reportedly can be successfully implemented under existing field strength limits.[3] Accordingly, NTIA does not recommend that the FCC relax Part 15 field strength limits for BPL systems. Further based on studies to date, NTIA recommends several “access” BPL compliance measurement provisions that derive from existing Part 15 measurement guidelines. Among these are requirements to: use measurement antenna heights near the height of power lines; measure at a uniform distance of ten (10) meters from the BPL device and power lines; and measure using a calibrated rod antenna or a loop antenna in connection with appropriate factors relating magnetic and electric field strength levels at frequencies below 30 MHz.“

“5.3.6 Measurement of BPL Using Different Antenna Heights

Measurements of BPL emissions from MV lines were performed using two different antenna heights. The results show that in general, the measured power levels were substantially higher at the greater antenna height. For example, the 100% duty cycle power measured at a frequency of 32.70 MHz and at a 10 meter antenna height was 4.8 to 10.7 dB greater than at 2 meters. The pulse power at a 10 meter antenna height for this same frequency was 8.2 to 15.1 dB higher than at 2 meters.

Measurements were also made of emissions from a LV power line carrying BPL signals from a LV coupler near a pole-mounted transformer to a house (Section D.3.5). The phase lines were twisted about the neutral line. A loop antenna was oriented to maximize the reception of the horizontal magnetic field. The antenna was located at 8.7 meters from the utility pole near the midpoint of the LV line and measurements were made at antenna heights of 2 meters and 10 meters at frequencies of 5 MHz, 6.43 MHz, 10.74 MHz and 18.38 MHz, each with resolution bandwidths of 3 kHz, 10 kHz and 30 kHz. The results indicate that measured power at a 10 meter height is always larger than the power measured at 2 meter height (by 3-9 dBm). Table 5-2 summarizes results from both these measurements for 100% duty cycle power where meaningful comparisons could be made.

Table 5-2: Measured 100% Duty Cycle Power at Two Different Antenna Heights

| **Frequency** | **Bandwidth** | **2 meter height** | **10 meter height** | **Difference** |
|---|---|---|---|---|
| 6.43 MHz | 3 kHz | -113.3 dBm | -108.7 dBm | 4.6 dB |
| 6.43 MHz | 10 kHz | -109.1 dBm | -106.4 dBm | 2.7 dB |
| 18.38 MHz | 3 kHz | -115.3 dBm | -106.6 dBm | 8.7 dB |
| 32.70 MHz | 30 kHz | -101.1 dBm | -96.3 dBm | 4.8 dB |
| 32.70 MHz | 10 kHz | -111.4 dBm | -100.7 dBm | 10.7 dB |

ShipCom participates in the GMDSS (Global Maritime Distress Safety System). A major part of this system is the use of DSC (Digital Selective Calling) to alert shore stations of a distress situation. A difference of only a few DB in the noise floor could prevent weak or even moderate DSC signals from being decoded. It is therefore possible that life or property could be lost as a direct result of interference caused to ShipCom's receivers as a result of BPL transmissions.

The United States Coast Guard also uses DSC equipment to guard the International Distress frequencies. These frequencies are not actively monitored by people, but rather depend on the reception of a DSC signal to alert the operator of a distress call. It is probable that interference to these frequencies would go undetected until it was too late.

The same holds true for the voice watch on 2182 KHz and other HF voice frequencies licensed for Distress calling. Typically these receivers are squelched to eliminate the background noise when no signals are being received. A difference of only a few DB in the noise floor could cause failure of the squelch to open upon reception of a weak or moderate distress call. Once again, human lives and property could be lost as a direct result of BPL interference.

One can only imagine the "field day" personal injury law firms would have if it were determined, or even suspected, that an unlicensed technology caused the loss of lives and/or property because of interference with distress frequencies.

The U.S. Coast Guard also operates other HF radio facilities; CAMSLANT and CAMSPAC. These two facilities are responsible to guard the HF radio transmissions from Coast Guard Aircraft engaged on Search and Rescue Missions, Law enforcement and most recently, Homeland Defense. Many of the deployed aircraft communicate with CAMSLANT and CAMSPAC on 5 MHz and 8 MHz channels. If an aircraft loses communication for an extended period of time, the Coast Guard may automatically launch a Search and Rescue mission for the pilots. It is even conceivable that a Coast Guard Aircraft in a distress situation may go unheard by their associated communications guard as a result of BPL interference.

The NTIA study revealed a possible wide spread interference effect from BPL due to signal aggregation and ionospheric propagation. We understand that the Phase-II NTIA study will pursue this issue further. The possible ramifications of widespread interference from BPL in the HF frequency range are significant. See the following excerpt from the NTIA study:

> 5.2.2 Propagation Modes
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> The dominant, relevant propagation modes in the 1.7 – 80 MHz frequency range are ground wave, space wave and sky wave. The ground wave signal can be a composite of a direct wave, a ground reflected wave and/or a surface wave. For a direct wave from a point source (*i.e.*, infinitesimal D, yield essentially no near field), the received power is inversely proportional to

the square of distance ($r^2$). If the radiator is located several wavelengths above ground, the direct wave and the ground reflected waves are considered as separate rays and the peak combined received power is inversely proportional to $r^4$. If the radiator is close to ground in terms of wavelength (*e.g.*, BPL below 40 MHz), it is no longer appropriate to consider separate rays. A surface wave propagates close to ground by inducing currents which flow in the ground and support (or potentially interfere with) short range communications. However, horizontally polarized surface waves are heavily attenuated, and, for any polarization, surface wave propagation exhibits substantially higher rates of attenuation with distance than the direct wave, especially at VHF frequencies (*i.e.*, above 30 MHz). In general, sky or ionospheric waves are important up to about 30 MHz, above which propagation is sporadic. Sky wave propagation may be represented by rays which are refracted and reflected from the ionosphere and is responsible for signal transmission to distances ranging from hundreds to thousands of kilometers, depending on elevation angle of the radiated field, frequency and variability of the ionosphere. The ionosphere, which ranges from about 60 to 600 km in height, acts as a low-conductivity dielectric.[i]

Space wave propagation occurs on line-of-sight signal paths above the height of the power lines where surface and reflected waves are received at magnitudes much less than the direct wave magnitude. Friis, or free-space loss typically is assumed for these paths although in most cases, reflected waves (multipath effects) can yield a degree of location variability of the received signal magnitude.

To summarize, propagation mechanisms of concern for BPL emissions toward or below the power line horizon will be by ground waves. For emissions in directions above the power line horizon, the propagation may be either by space and ground waves for shorter distances or by sky waves for larger distances.

"Sky waves suffer large losses mainly due to ionospheric absorption and polarization coupling losses. In a dense deployment of BPL systems, there may be aggregation of co-frequency BPL emissions toward the ionosphere. Emissions in directions above the power lines may aggregate via sky wave or via ground wave and space wave, and emissions toward or below the power lines generally may aggregate via ground wave. Preliminary modeling of power lines (Appendix E) suggests that there is relatively strong radiation in directions above the power line horizon (*i.e.*, higher than radiation toward directions below the power lines), and so, aggregation of BPL signals at

> locations above power lines may be more significant than at lower heights where BPL signal propagation is less efficient."

According to an April 26, 2004 article in the Christian Science Monitor experiments with BPL in England and Japan generated so much interference they were terminated. (See the following excerpt from the CSM article:)

> "Other nations, however, have already made up their mind.
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> "It's a brilliant idea, but if you give it a more technical, detailed look, it all falls apart," says Diethard Hansen, the external chairman of the advisory group on BPL to RegTP, Germany's FCC equivalent. "It suffers the enormous risk of uncontrolled interference to everyone."
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> During test trials of BPL in Britain and Japan, Mr. Hansen says, interference was so strong that they pulled the plug on BPL.
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> "In Manchester [England], they failed miserably in the shortwave frequency bands because the streetlights started working as antennas," he says. "In Japan, they had limited field trials in Osaka and Tokyo, and interference got out of control. They had to stop it." Ham-radio operators are concerned that BPL will cause the same problems in the US."

Neither the Commission nor the proponents of BPL have provided evidence that the proposed implementation of BPL in the U.S. differs from the failed experiments in England and Japan.

<u>Conclusion</u>

The recent 911 hearings brought to light that one of the contributors to the loss of many lives was the use of incompatible radio equipment (Interoperability). Hearing testimony revealed that the decisions to purchase certain new radios were hastily made without full regard to the technical ramifications of these decisions. ShipCom is concerned that the Commission, in its haste to provide a solution to increased broadband availability, may be making the same mistake by approving a technology without fully considering all of the technical ramifications and effects it will have on other communication facilities.

The extent to which BPL interference will cause the loss of communication on HF channels is not now known. Certainly, the Commission should not proceed with this docket until these matters are known. There is no justification to unnecessarily risking the lives of mariners, passenger and aircraft crews and rescue personal in the name of rushing for BPL approval.

It was only on April 28, 2004 that ShipCom learned that the NTIA study was a two phase study. The second phase of this study is to study the effects of aggregation and ionosphere propagation of BPL signals.

ShipCom joins the many other petitioners in requesting a postponement of the decision on this docket. It is only prudent that the Commission extend the comment period on this NPRM until the NTIA has completed its second phase study and the public has had an opportunity to study the report and comment on it. Only by extending the comment period can the Commission have all the relevant information at its disposal so that it may render a reasoned and informed decision regarding BPL expansion. To do less could result in significant damage to the communication industry, the Commission and the BPL operators. For example, if BPL is granted the right to deploy at new higher power settings and it is later learned that the interference caused by aggregation and ionosphere propagation is such that serious harmful interference is caused to licensed facilities, the Commission would be faced with remedying this problem.

Providers of BPL service will have gone to great expense to construct BPL infrastructure. It is quite possible these providers would have to go through the economic hardship of re-designing or even dismantling that infrastructure. It is equally unreasonable to subject licensed users of this spectrum to the expense of locating and identifying sources of BPL interference. It is unthinkable to subject Mariners and aviators, first responders and law enforcement personnel to a possible loss of emergency communications that could result in the loss of life and property. Therefore, ShipCom urges the Commission to carefully consider extending the time for comments, to await the results of the NTIA Phase II study and to carefully examine comments made by reputable engineers and associations in this matter prior to the Commission making any decision.